

**STANDARD OPERATING PROCEDURES
FOR MEASURING
NATURAL ATTENUATION PARAMETERS
AT BOEING REALTY CORPORATION
FORMER C-6 FACILITY**

**REVISION 1.0
JANUARY 9, 2001**

prepared for

**Boeing Realty Corporation
19503 S. Normandie Avenue
Los Angeles, California**

prepared by



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January 9, 2001

Project No. 887

Ms. Stephanie M. Sibbett
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Transmittal
Standard Operating Procedures for
Measuring Natural Attenuation Parameters
Boeing Realty Corporation
Former C-6 Facility
19503 South Normandie Avenue
Los Angeles, California

Dear Ms. Sibbett:

Transmitted herewith are five copies of the standard operating procedures for measuring natural attenuation parameters at the subject site. England Geosystem, Inc. and Haley & Aldrich, Inc. appreciate the opportunity of providing services to Boeing Realty Corporation. If you have any questions, please do not hesitate to call.

Respectfully submitted,

ENGLAND GEOSYSTEM, INC.

A handwritten signature in black ink, appearing to read "Mohsen Mehran".

Mohsen Mehran, Ph.D.
Principal

MM:sh

cc: Mr. Scott Zachary - Haley & Aldrich, Inc.
Mr. Mehmet Pehlivan - Tait & Associates

**STANDARD OPERATING PROCEDURES FOR
MEASURING NATURAL ATTENUATION PARAMETERS
AT BOEING REALTY CORPORATION
FORMER C-6 FACILITY
Los Angeles, California
Revision 1.0 – January 9, 2001**

Prepared for

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Standard Operating Procedures
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Introduction and Special Instructions
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Introduction

This document contains standard operating procedures (SOPs) for measuring natural attenuation parameters at the Boeing Realty Corporation C-6 Facility in Los Angeles, California. The procedures included in this document are based on the *Draft Statement of Work for Evaluation of Natural Attenuation at Boeing Realty Corporation's C-6 Facility, Torrance, California*, prepared by Exponent and dated December 15, 2000. The procedures and parameters, presented herein, are also consistent with the natural attenuation documents issued by the U.S. Environmental Protection Agency (1998, 1999).

Special Instructions for January 2001 Sampling Event

Following are special instructions for the January 2001 sampling event that may deviate from SOPs.

- A ***Horiba U-22 Multi-Parameter Water Quality Instrument*** equipped with a flow-through cell (approximately 1 liter capacity) and probes/meters capable of measuring dissolved oxygen, oxidation reduction potential, pH, conductivity and temperature will be utilized for this event. This unit has an automatic one-point calibration process. The instrument will be operated according to Horiba's specifications.
- Water level measurements will be collected during purging along with each flow-through cell probe reading to ensure that drawdown does not exceed 10% of the wetted screen interval. Water level measurements will be attempted in the 2-inch wells.
- Samples collected for metals will be filtered in the field through a 0.45 micron filter and preserved with nitric acid (this will increase holding time significantly).
- Major cations will include: sodium, total iron, manganese, calcium, and magnesium.
- The analytical laboratory for the January 2001 event will be **STL Los Angeles** (STL) located in Santa Ana. The test methods, sample containers, preservatives, samples which can be combined, holding times, trip blanks and scheduling will be coordinated with STL prior to sampling.

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STANDARD OPERATING PROCEDURES

GENERAL PROTOCOLS

- General Sampling Protocols SOP-GW-GENERAL-01

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General Sampling Protocols
(SOP-GW-GENERAL-01)
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General Sampling Protocol

To minimize turbulence within the well and allow collection of representative dissolved oxygen (DO), methane, ethane and ethene readings, the wells will be purged using low flow purging techniques with either a submersible or positive displacement pump (bladder pump). Pumping rates will be maintained at 1 gpm or less and well drawdown will be minimized to the extent possible at those pumping rates.

Monitoring Equipment and Procedures

The information related to instruments, sampling devices, and equipment specifications is intended to supplement the manufacturer's recommendations. Calibration procedures are provided for specific equipment. When equivalent equipment is used, the manufacturer's recommendations should be followed.

Well Purging

At least three casing volumes of ground water will be withdrawn from each well prior to sample collection. The volume of water present in each well will be computed based on the length of the water column and the well casing diameter. Refer to SOP-GW-GENERAL-02 for further purging details.

Purge and decontamination water will be placed directly into UN1AZX400S 55-gallon (formerly DOT 17H) drums. Drums will be sealed and labeled.

Purging and sampling will be performed on the wells in order of the concentrations of chemical constituents found in the ground water in previous sampling events. The wells with the lowest concentrations of detected compounds will be purged and sampled first and the ones with the highest concentrations of detected compounds will be purged and sampled last.

Field Sampling

The following parameters will be monitored in the field during purging:

- Dissolved oxygen (DO)
- Oxidation reduction potential (ORP) (also referred to as Redox or eH)
- Temperature, pH, and electrical conductivity



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DO and ORP will be measured within a flow-through cell. A flow-through cell is an airtight chamber that is connected to the pump discharge. The extracted water flows through the cell minimizing contact with atmospheric gases. Pressure of less than 15 psi is necessary when using the flow-through cell. Flow through the cell will be adjusted so that it is laminar and has no bubbling.

DO and temperature will be monitored with an YSI model 55 Unit or equivalent. ORP and pH will be monitored with a Barnant Model 20 Unit. Electrical conductivity will be monitored with a Hydac meter. All probes/meters are to be calibrated each day prior to use as indicated in the manufacturer's instructions. All parameters will be measured throughout the purging sequence and evaluated as they are being collected. At a minimum, the parameters should be collected at the start of purging, after each well volume, and at the end of purging.

Quality Control Ground Water Samples

Trip blanks, equipment blanks, field blanks, and field duplicates will be used for quality control purposes. The following information defines and explains the required field quality control samples.

Trip Blanks – Trip blanks will be derived as samples, which originate from analyte-free water taken from the laboratory to the site and returned to the laboratory with the volatile organic analysis (VOA) samples. One trip blank will accompany each cooler containing VOAs, will be stored at the laboratory with the samples, and will be analyzed by the laboratory.

Equipment Blanks – Equipment blanks will be the final distilled water rinses from equipment cleaning of pumps and bailers. Equipment blanks will be collected daily when the sampling equipment is used. Initially, only samples collected every other day will be analyzed. If analytes pertinent to the project are found in the blank, the remaining samples will be analyzed. The results from the blanks will be used to flag or assess the levels of analytes in the samples. This comparison will be made during data validation. The equipment blanks will be analyzed for the same parameters as the related samples.

Field Duplicates – The duplicates for water samples will be collected simultaneously. Field duplicates will be collected at a frequency of 10 percent per sampling event. All duplicates will be sent to the laboratory responsible for the analysis for which the primary sample is being analyzed.



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Field Blanks – Field blanks consist of the source water used in decontamination and steam cleaning. One field blank from each event and each source of water must be collected and analyzed for the same parameters as the related samples.

Sample Handling

Sample Containers and Preservation

Sample containers with appropriate preservation will be obtained from the laboratories. Sampling methods, sample volume, sample containers, preservative and holding times may vary from one laboratory to another. Prior to each sampling event, the analytical laboratory should be contacted to coordinate the event. At a minimum, the following should be discussed with the laboratory:

- List of analytes and preferred analytical test methods
- Sample containers and preservative - determine if any samples can be combined to reduce field sampling effort
- Approximate number of samples to be submitted and schedule for sampling
- Discuss holding times and any special scheduling for samples with short holding times
- Trip blank requirements
- Detection limits

Sample Packaging and Shipping

All samples will be packed in the following manner:

- Each set of containers will be wrapped in bubble pack or other packing material (if necessary to prevent damage), placed in separate sealable plastic bags, and then placed in an ice chest pre-cooled to approximately 4oC with Blue Ice packages or double-bagged ice packets.
- The completed chain-of-custody record going to the laboratory will accompany the cooler. The coolers will be transported or shipped to the laboratory.

All samples will be shipped to the laboratory via an overnight delivery service or couriered on the same day as the samples are collected. The laboratory will be contacted when samples are shipped so they are prepared to receive them. Samples to be analyzed



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for parameters with holding times less than 72 hours should not be collected on Fridays unless an arrangement has been made with the laboratory to analyze the samples within the holding time.



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PURGING PROTOCOLS

▪ General Purging Protocols

SOP-GW-GENERAL-02

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General Purging Protocol

Prior to sampling, the wells will be purged to remove standing water in the well casings and motivate the inflow of representative ground water from the surrounding formation. To minimize agitation, a low-disturbance device such as a positive displacement pump or a flow-controlled submersible pump set to 1 to 2 gpm will be used for pumping. To estimate the amount of water that needs to be removed, the volume of water contained in the well will be calculated based on height of water, and diameter of the well (refer to Form 1 for well volume calculation). At least three wetted casing volumes should be removed and purging should continue until field-measured parameters stabilize. In low-producing wells, 1 to 3 casing volumes may be sufficient. If the well is evacuated to a dry state, the well should be sampled when sufficient water is collected in the casing.



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EQUIPMENT DECONTAMINATION PROCEDURES

- | | |
|--|--------------|
| ▪ Non-Dedicated Submersible
Pump and Pump Apparatus | SOP-DECON-01 |
| ▪ Field Probes/Meters | SOP-DECON-02 |
| ▪ Flow-Through Cell | SOP-DECON-03 |

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Equipment Decontamination Procedures
(SOP-DECON-01)
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Non-Dedicated Submersible Pump and Pump Apparatus

The following procedure will be employed for decontamination of a non-dedicated submersible pump (Grundfos RediFlo2, or equivalent) before usage and between wells. The procedures are also applicable to any portion of well sampling apparatus that would be considered to be non-dedicated equipment (i.e., it is used at multiple sampling locations).

1. If dedicated flexible tubing is used for evacuation and sampling, place the pump in a container sufficiently large enough to hold the pump and 5 gallons of non-phosphate detergent/clean water solution and pump the mixture through the pump to a disposal drum. Then using two additional clean control water (deionized or distilled) 5-gallon containers repeat the process in the clean control water, discharging the used water to waste.

If non-dedicated flexible tubing (not recommended – see project manager) is used for evacuation and sampling, increase the volume of detergent mixture to 20 gallons and add a third 5-gallon rinse of clean control water.

2. Using a non-phosphate detergent solution and a medium stiff brush, wash the exterior of the pump, exterior of non-dedicated discharge hoses or piping, control cabling, suspension lines and any equipment associated with lowering the sampling apparatus into the well (i.e., slip jaws, wrenches etc.) before initial usage and after withdrawal from every well with clean tap water and non-phosphate detergent.
3. Pressure steam clean exterior surface of pumps, interior and exterior of non-dedicated discharge hoses or piping, control cabling, suspension lines and any equipment associated with lowering the sampling apparatus into the well (i.e., slip jaws, wrenches etc.) before initial usage and after withdrawal from every well with clean tap water in the steam reservoir.

During steam cleaning operations:

1. Follow all applicable Site Health and Safety Procedures.



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(SOP-DECON-01)
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2. Follow all Site Sampling Plan procedures for collection of decontamination effluent.
3. Exercise care with pumps and plastics avoiding damage to them with the hot water.
4. Inspect for remaining particles, surface film or odor and repeat cleaning and rinsing procedures, if necessary.
5. Air dry.



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Equipment Decontamination Procedures
(SOP-DECON-02)
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Field Probes/Meters

The following general decontamination procedure will be employed for the field probes and meters:

1. Wash and scrub with non-phosphate detergent, clean water solution.
2. Rinse three times with clean control water (deionized or distilled).
3. Inspect for remaining particles and surface films.
4. Repeat steps 1 through 3, as necessary.
5. Air dry.



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Equipment Decontamination Procedures
(SOP-DECON-3)
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Flow-Through Cell

The following general decontamination procedure will be employed for the flow-through cell associated hoses and fittings:

1. Wash and scrub with non-phosphate detergent, clean water solution.
2. Rinse three times with clean control water (deionized or distilled).
3. Inspect for remaining particles and surface films.
4. Repeat steps 1 through 3, as necessary.
5. Air dry.



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STATIC FLUID LEVEL MEASUREMENT

- Water Level Measurement

SOP-SURVEY-01

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Static Fluid Level Measurement
(SOP-SURVEY-01)
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Water Level Measurement (integral measurement point sounders, i.e., Solinst, et al.)

General Considerations

1. Water level sounding instruments will be length calibrated on a semi-annual basis.
2. For the purpose of determining purge volumes, water levels may be measured in sampled wells up to 36 hours prior to sampling. This allows a site-wide water level map to be constructed to identify anomalous areas prior to sampling.
3. When practical with consideration to downhole sampling system, water levels should be measured immediately prior to purging and again immediately prior to sampling.

Note: Measurement requirements will be tempered by sampling conditions (i.e., in a two-inch well with a pump and any associated discharge hoses and/or electrical, it will be impractical to attempt measurement).

Procedure

1. Where previous depth information is available, review the previous depth to water.
2. Lower the sensor into the well avoiding contact to the extent possible with the sides of the well casing.
3. Slow the probe descent, as the approximate water depth is reached, to avoid splashing.
4. At the indication of contact with the water (either tone or light) stop the downward advance of the probe.
5. Slowly raise the probe until the indication just stops.
6. Place the tape at the indicated measuring point on the well casing and slowly lower the probe with thumb and forefinger at the measuring point until the indicator denotes that the water level has been reached. Note the depth to water to the nearest 0.01 feet.
7. Raise the probe slightly and repeat the procedure in Step 6 until the difference between the noted and the second measured water level is 0.01 feet or less. Record the depth to water.



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Static Fluid Level Measurement
(SOP-SURVEY-01)
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Field Instrument Calibration Procedure

Daily

1. Prior to use, inspect for visible signs of wear, deterioration and kinks, especially at the probe/tape connection.
2. Test the light and/or tone producing mechanism as per manufacturer's instructions.

Semi-annually

1. Use either a surveyor's tape tensioned to the noted amount or a surveyed length course.
2. Unroll the sounder and tension it to the manufacturer's suggestion using a standard surveyors tensiometer.
3. Record the sounder instrument number (serial number), the sounder length, and the calibrated tape length at 10-ft intervals to the total length of the sounder.
4. Once completed, compile the data and prepare an error summary based on 20-foot length of sounder. If the error is constant, note it as a length adjustment per 20 feet of sounder length (i.e., 0.001 ft/20 ft – the value should be negative if the sounder is longer than the calibrated length and positive if shorter).
5. If there are discrete differences, note them at the depth found (consider a tape replacement).
6. Place a plastic encased record either on or attached to the instrument.

Data Recording Requirements

Form 2: Water Level Data Form

Form 4: Daily Field Activity Report

Optionally: Field Sampling Data Form

All applicable form information must be completed by the sampling technician. In the absence of a preprinted form, the technician should record:

1. Instrument serial number
2. Date and time of measurement
3. Sampling Point Identification (Well ID)
4. Depth to water in feet to the nearest 0.01 feet
5. Noted error in sounder at the nearest depth
6. Well condition and comments
7. Weather conditions and approximate temperature



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Equipment Decontamination

See “Equipment Decontamination Procedures, *Field Probes/Meters* (SOP-DECON-02)” for probes and field instruments.



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**SAMPLING PROCEDURES FOR ANALYTES
MEASURED IN THE FIELD**

- | | |
|---------------------------------|--------------|
| ▪ Dissolved Oxygen | SOP-FS-GW-01 |
| ▪ Oxidation Reduction Potential | SOP-FS-GW-02 |
| ▪ Temperature | SOP-FS-GW-03 |
| ▪ pH | SOP-FS-GW-04 |
| ▪ Electrical Conductivity | SOP-FS-GW-05 |

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Sampling Procedures for Analytes
Measured in the Field
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<u>Analyte:</u>	<i>Dissolved Oxygen (DO)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Field measurement (DO and Temperature on a single probe)
<u>Test Method:</u>	Field instrument (YSI Model 55 or equivalent)
<u>Purging Method:</u>	Submersible or positive displacement (bladder) pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Flow-through cell
<u>Sample Volume:</u>	Full flow-through cell
<u>Sample Container:</u>	Flow-through cell
<u>Sample Preservation:</u>	None
<u>Sample Hold Time:</u>	Analyze immediately
<u>Sample Disposal:</u>	Dispose with purge water

Field Instrument Calibration Procedure

Information provided is for an YSI Model 55 field instrument.

Consult the manufacturers recommendations for maintenance and calibration of alternative field instruments.

Calibration of the DO meter should be performed at the beginning of the sampling day and checked at the middle and end of the sample day. Calibration should also be performed if the instrument is turned off.

1. Prior to DO meter calibration, the following information will be required:
 - a. Approximate altitude of the sampling point (screened interval midpoint).
 - b. Approximate salinity of the water (fresh water; 0 ppm, sea water; 35 ppm).
2. Perform the calibration in a protected temperature-controlled environment with the temperature being within 10° C of the expected water temperature.
3. Ensure that the sponge inside the instrument's calibration chamber is wet, then insert probe into calibration chamber.



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4. Turn the instrument on by pressing the on/off button. Wait for the temperature and dissolved oxygen readings to stabilize (approximately 15 minutes).
5. Enter calibration mode (on the YSI-55 – press the up and down arrows simultaneously).
6. On the YSI-55, you will be prompted to enter the altitude in 100's of feet (0 for C-6 facility), use the up and down arrows to increase or decrease the altitude, when the proper altitude appears, press ENTER. At this point, CAL should appear in the lower left of the LCD window and a calibration value will be displayed in the lower right of the window. The current DO measurement will appear in the main display.
7. After observing the DO measurement value for a period to ensure that it is stable, press the ENTER button. You will be prompted to enter the approximate salinity of the water (0 to 40 are acceptable values). Use the arrow keys to select the appropriate value, then press ENTER. Calibration is now complete and the instrument will return to normal operation.

Sample Collection Procedure

1. Use a flow-through cell that contains a volume of less than five (5) times the anticipated inflow rate.
2. Shade or protect flow-through cell from sunlight and wind so that the temperature of discharge water is maintained as close to in-situ temperature as possible.
3. Insert probes (DO, ORP & pH) through airtight fittings.
4. Ensure that all fittings for probes are airtight.
5. Connect flow-through cell intake directly to pump discharge.
6. Use at least a 3-foot long discharge hose from the flow-through cell to discharge location.
7. Maintain a flow rate through the cell of less than 3 l/min or 1 gpm.
8. Allow readings to stabilize as flow moves through the cell. Record DO measurement along with the date, time, and approximate purge water volume, at measurement time.



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**Sampling Procedures for Analytes
Measured in the Field**
(SOP-FS-GW-01)
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Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 3: Ground Water Field Parameters
See Form 4: Daily Field Activity Report

All applicable information must be completed by the sampling technician

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.
2. DO probe should be cleaned and decontaminated according to procedures outlined in SOP DECON-02.
3. Flow-through cell must be cleaned and decontaminated according to procedures outlined in SOP DECON-03.



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Sampling Procedures for Analytes
Measured in the Field
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<u>Analyte:</u>	<i>Oxidation Reduction Potential (ORP)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Field measurement
<u>Test Method:</u>	Field instrument (pH, ORP combined)
<u>Purging Method:</u>	Submersible or positive displacement (bladder) pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Flow-through cell
<u>Sample Volume:</u>	Full flow-through cell
<u>Sample Container:</u>	Flow-through cell
<u>Sample Preservation:</u>	None
<u>Sample Hold Time:</u>	Analyze immediately
<u>Sample Disposal:</u>	Dispose with purge water

Field Instrument Calibration Procedure

Information provided is for a Barnant Model 20 field instrument. For alternative field instruments, consult the manufacturers' recommendations for maintenance and calibration.

Calibration of the pH/ORP meter should be performed at the beginning of the sampling day and checked at the middle and end of the sampling day. Calibration should also be performed if the instrument is turned off.

There is no specific calibration procedure for the ORP portion of the meter. Calibration occurs concurrently with pH calibration as outlined below:

1. Perform the calibration in a protected temperature-controlled environment with the temperature being within 10° C of the expected water temperature.
2. Obtain fresh (less than 1 month old) pH buffer solutions with pH of 4, 7 and 10.
3. Remove the protective cap on the probe and vigorously stir the probe in a clean clear rinse solution, remove and shake the probe with a snap action to remove residual rinse.
4. Set the temperature value on the meter to the approximate temperature of the buffer solution.
5. Vigorously stir the electrode probe in 7.0 pH buffer solution, then allow the electrode to rest against the side of the buffer beaker.



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6. Allow the reading to stabilize and then use the pH meter zero adjustment to make the meter read the buffer solution value (i.e., 7.0).
7. Repeat step 3.
8. Vigorously stir the electrode probe in 4.0 pH buffer solution, then allow the electrode to rest against the side of the buffer beaker.
9. Allow the reading to stabilize and then use the pH meter slope adjustment to make the meter read the buffer solution value (i.e., 4.0).
10. Repeat step 3.
11. Vigorously stir the electrode probe in 10.0 pH buffer solution, then allow the electrode to rest against the side of the buffer beaker.
12. Allow the reading to stabilize and then use the pH meter slope adjustment to make the meter read the buffer solution value (i.e., 10.0).
13. It may be necessary to repeat steps 5, 8 and 11 several times to obtain a calibration.

Sample Collection Procedure

1. Use a flow-through cell that contains a volume of less than five (5) times the anticipated inflow rate.
2. Shade or protect flow-through cell from sunlight and wind so that temperature of the discharge water is maintained as close to in-situ temperature as possible.
3. Insert probes (DO, ORP & pH) through airtight fittings.
4. Ensure that all fittings for probes are airtight.
5. Connect flow-through cell intake directly to pump discharge.
6. Use at least a 3-foot long discharge hose from the flow-through cell to discharge location.
7. Maintain a flow rate through the cell of less than 3 l/min or 1 gpm.



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**Sampling Procedures for Analytes
Measured in the Field**
(SOP-FS-GW-02)
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8. Allow readings to stabilize as flow moves through the cell. Record ORP measurement along with the date, time and approximate purge water volume at measurement time.

Data Recording Requirements

- See Form 1: Monitoring Well Purge and Sample Form
- See Form 3: Ground Water Field Parameters
- See Form 4: Daily Field Activity Report

All applicable information must be completed by the sampling technician

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.
2. ORP probe should be cleaned and decontaminated according to procedures outlined in SOP-DECON-02.
3. Flow-through cell must be cleaned and decontaminated according to procedures outlined in SOP-DECON-03.



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<u>Analyte:</u>	<i>Temperature</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Field measurement (DO and Temperature on a single probe)
<u>Test Method:</u>	Field instrument (YSI Model 55 or equivalent)
<u>Purging Method:</u>	Submersible or positive displacement (bladder) pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Flow-through cell
<u>Sample Volume:</u>	Full flow-through cell
<u>Sample Container:</u>	Flow-through cell
<u>Sample Preservation:</u>	None
<u>Sample Hold Time:</u>	Analyze immediately
<u>Sample Disposal:</u>	Dispose with purge water

Field Instrument Calibration Procedure

Information provided is for a YSI Model 55 field instrument. Consult the manufacturers' recommendations for maintenance and calibration of alternative field instruments.

No calibration of the YSI Model 55 is necessary for obtaining temperature readings.

Sample Collection Procedure

1. Use a flow-through cell that contains a volume of less than five (5) times the anticipated inflow rate.
2. Shade or protect flow-through cell from sunlight and wind so that the temperature of discharge water is maintained as close to in-situ temperature as possible.
3. Insert probes (DO/TEMPERATURE, ORP & pH) through airtight fittings.
4. Ensure that all fittings for probes are airtight.
5. Connect flow-through cell intake directly to pump discharge.
6. Use at least a 3-foot long discharge hose from the flow-through cell to discharge location.
7. Maintain a flow rate through the cell of less than 3 l/min or 1 gpm.



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8. Allow readings to stabilize as flow moves through the cell. Record DO measurement along with the date, time and approximate purge water volume at measurement time.

Data Recording Requirements

- See Form 1: Monitoring Well Purge and Sample Form
- See Form 3: Ground Water Field Parameters
- See Form 4: Daily Field Activity Report

All applicable information must be completed by the sampling technician

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.
2. DO probe should be cleaned and decontaminated according to procedures outlined in SOP DECON-02.
3. Flow-through cell must be cleaned and decontaminated according to procedures outlined in SOP DECON-03.



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<u>Analyte:</u>	<i>pH</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Field measurement
<u>Test Method:</u>	Field instrument (pH, ORP combined)
<u>Purging Method:</u>	Submersible or positive displacement (bladder) pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Flow-through cell
<u>Sample Volume:</u>	Full flow-through cell
<u>Sample Container:</u>	Flow-through cell
<u>Sample Preservation:</u>	None
<u>Sample Hold Time:</u>	Analyze immediately
<u>Sample Disposal:</u>	Dispose with purge water

Field Instrument Calibration Procedure

Information provided is for a Barnant Model 20 field instrument. For alternative instruments, consult the manufacturers' recommendations for maintenance and calibration of alternative field instruments.

Calibration of the pH/ORP meter should be performed at the beginning of the sampling day and checked at the middle and end of the sample day. Calibration should also be performed if the instrument is turned off.

1. Perform the calibration in a protected temperature-controlled environment with the temperature being within 10° C of the expected water temperature.
2. Obtain fresh (less than 1 month old) pH buffer solutions with pH of 4, 7 and 10.
3. Remove the protective cap on the probe and vigorously stir the probe in a clean clear rinse solution, remove and shake the probe with a snap action to remove residual rinse.
4. Set the temperature value on the meter to the approximate temperature of the buffer solution.
5. Vigorously stir the electrode probe in 7.0 pH buffer solution, then allow the electrode to rest against the side of the buffer beaker.



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6. Allow the reading to stabilize and then use the pH meter zero adjustment to make the meter read the buffer solution value (i.e., 7.0).
7. Repeat step 3.
8. Vigorously stir the electrode probe in 4.0 pH buffer solution, then allow the electrode to rest against the side of the buffer beaker.
9. Allow the reading to stabilize and then use the pH meter slope adjustment to make the meter read the buffer solution value (i.e., 4.0).
10. Repeat step 3.
11. Vigorously stir the electrode probe in 10.0 pH buffer solution, then allow the electrode to rest against the side of the buffer beaker.
12. Allow the reading to stabilize and then use the pH meter slope adjustment to make the meter read the buffer solution value (i.e., 10.0).
13. It may be necessary to repeat steps 5, 8, and 11 several times to obtain a calibration.

Sample Collection Procedure

1. Use a flow-through cell that contains a volume of less than five (5) times the anticipated inflow rate.
2. Shade or protect flow-through cell from sunlight and wind so that temperature of the discharge water is maintained as close to in-situ temperature as possible.
3. Insert probes (DO, ORP & pH) through airtight fittings.
4. Ensure that all fittings for probes are airtight.
5. Connect flow-through cell intake directly to pump discharge.
6. Use at least a 3-foot long discharge hose from the flow-through cell to discharge location.
7. Maintain a flow rate through the cell of less than 3 l/min or 1gpm.
8. Allow readings to stabilize as flow moves through the cell. Record pH measurement along with the date, time and approximate purge water volume, at measurement time.



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Data Recording Requirements

- See Form 1: Monitoring Well Purge and Sample Form
- See Form 3: Ground Water Field Parameters
- See Form 4: Daily Field Activity Report

All applicable information must be completed by the sampling technician

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.
2. DO probe should be cleaned and decontaminated according to procedures outlined in SOP DECON-02.
3. Flow-through cell must be cleaned and decontaminated according to procedures outlined in SOP DECON-03.



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<u>Analyte:</u>	<i>Electrical Conductivity (Field)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Field measurement
<u>Test Method:</u>	Field instrument (Hydac or equivalent)
<u>Purging Method:</u>	Submersible or positive displacement (bladder) pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Flow-through cell
<u>Sample Volume:</u>	Full flow-through cell
<u>Sample Container:</u>	Flow-through cell
<u>Sample Preservation:</u>	None
<u>Sample Hold Time:</u>	Analyze immediately
<u>Sample Disposal:</u>	Dispose with purge water

Field Instrument Calibration Procedure

Information provided is for a Hydac field instrument. Consult manufacturers' recommendations for maintenance and calibration of alternative field instruments. Conductance and temperature are factory calibrated for this specific instrument. Electrical Conductivity can be field calibrated using manufacturer's recommended procedure.

Sample Collection Procedure

1. Use a flow-through cell that contains a volume of less than five (5) times the anticipated inflow rate.
2. Shade or protect flow-through cell from sunlight and wind so that temperature of the discharge water is maintained as close to in-situ temperature as possible.
3. Insert probes (DO, ORP & pH) through airtight fittings.
4. Ensure that all fittings for probes are airtight.
5. Connect flow-through cell intake directly to pump discharge.
6. Use at least a 3-foot long discharge hose from the flow-through cell to discharge location.
7. Maintain a flow rate through the cell of less than 3 l/min or 1 gpm.



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8. Collect approximately 6 oz of purged water from the sampling valve of the flow-through cell into a clean plastic or glass container.
9. Place probe into container or fill sample cup on meter, allow reading to stabilize and record the measurement.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 3: Ground Water Field Parameters
See Form 4: Daily Field Activity Report

All applicable information must be completed by the sampling technician

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.
2. DO probe should be cleaned and decontaminated according to procedures outlined in SOP DECON-02.
3. Flow-through cell must be cleaned and decontaminated according to procedures outlined in SOP DECON-03.



ENGLAND GEOSYSTEM, INC.
STANDARD OPERATING PROCEDURES

**SAMPLING PROCEDURES FOR ANALYTES
MEASURED IN THE ANALYTICAL LABORATORY**

▪ Iron II (Soluble Iron)	SOP-FS-GW-06
▪ Methane	SOP-FS-GW-07
▪ Ethane	SOP-FS-GW-08
▪ Ethene	SOP-FS-GW-09
▪ Nitrite	SOP-FS-GW-10
▪ Nitrate	SOP-FS-GW-11
▪ Sulfate	SOP-FS-GW-12
▪ Chloride	SOP-FS-GW-13
▪ Total Organic Carbon	SOP-FS-GW-14
▪ Major Cations	SOP-FS-GW-15
▪ Aromatic and Chlorinated Hydrocarbons	SOP-FS-GW-16
▪ Soluble Manganese	SOP-FS-GW-17
▪ Alkalinity	SOP-FS-GW-18

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Sampling Procedures for Analytes
Measured in the Analytical Laboratory
(SOP-FS-GW-06)
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NOTE: LOW FLOW SAMPLING TECHNIQUE REQUIRED
HOLD TIME ALERT!!

<u>Analyte:</u>	<i>Iron II (Soluble Iron—Fe⁺²)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	SM 3500D or 6010B
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 250 ml/min or less
<u>Sample Volume:</u>	100 ml
<u>Sample Container:</u>	Plastic bottle
<u>Sample Preservation:</u>	Cool to 4° C
<u>Sample Hold Time:</u>	24 hours --- SAMPLE MUST ARRIVE AT LAB AND BE EXTRACTED WITHIN 24 HOURS OF SAMPLING
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure
- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 250 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.



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**Sampling Procedures for Analytes
Measured in the Analytical Laboratory**
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Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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**Sampling Procedures for Analytes
Measured in the Analytical Laboratory**
(SOP-FS-GW-07)
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<u>Analyte:</u>	<i>Methane (CH₄)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	EPA RSK-175
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less. No head space
<u>Sample Volume:</u>	3 - 40 ml VOAs (for RSK-175; includes methane, ethane and ethene)
<u>Sample Container:</u>	Glass VOA
<u>Sample Preservation:</u>	HCl, Cool to 4° C
<u>Sample Hold Time:</u>	14 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure

- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 40 ml/min or less with unfiltered, non-aerated sample water.
2. Positive meniscus (fill to top of VOA creating positive meniscus then fill cap prior to placing cap on VOA).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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**Sampling Procedures for Analytes
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<u>Analyte:</u>	Ethane (C₂ H₆)
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	EPA RSK-175
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less. No head space
<u>Sample Volume:</u>	3 - 40 ml VOAs (for RSK-175; includes methane, ethane and ethene)
<u>Sample Container:</u>	Glass VOA
<u>Sample Preservation:</u>	HCl, Cool to 4° C
<u>Sample Hold Time:</u>	14 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure

1. DO probe should be cleaned and decontaminated according to procedures outlined in SOP DECON-02.

Sample Collection Procedure

1. Fill container at rate of 40 ml/min or less with unfiltered, non-aerated sample water.
2. Positive meniscus (fill to top of VOA creating positive meniscus then fill cap prior to placing cap on VOA).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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**Sampling Procedures for Analytes
Measured in the Analytical Laboratory**
(SOP-FS-GW-09)
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<u>Analyte:</u>	<i>Ethene (C₂ H₄)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	EPA RSK-175
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less. No head space
<u>Sample Volume:</u>	3 - 40 ml VOAs (for RSK-175; includes methane, ethane and ethene)
<u>Sample Container:</u>	Glass VOA
<u>Sample Preservation:</u>	HCl, Cool to 4° C
<u>Sample Hold Time:</u>	14 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure
- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 40 ml/min or less with unfiltered, non-aerated sample water.
2. Positive meniscus (fill to top of VOA creating positive meniscus then fill cap prior to placing cap on VOA).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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**Sampling Procedures for Analytes
Measured in the Analytical Laboratory**
(SOP-FS-GW-10)
Revision 1.0 – 01/09/01

NOTE: LOW FLOW SAMPLING TECHNIQUE REQUIRED
HOLD TIME ALERT!!

<u>Analyte:</u>	<i>Nitrite (NO₂)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	EPA 354.1 (0.01 mg/l)
<u>Purging Method:</u>	Submersible or bladder pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less
<u>Sample Volume:</u>	500 ml
<u>Sample Container:</u>	Plastic
<u>Sample Preservation:</u>	H ₂ SO ₄ , Cool to 4° C
<u>Sample Hold Time:</u>	48 hours --- SAMPLE MUST ARRIVE AT LAB AND BE EXTRACTED WITHIN 48 HOURS OF SAMPLING
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure
- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 100 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.



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Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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Sampling Procedures for Analytes
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NOTE: LOW FLOW SAMPLING TECHNIQUE REQUIRED
HOLD TIME ALERT!!

<u>Analyte:</u>	<i>Nitrate (NO₃)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed Base Laboratory
<u>Test Method:</u>	EPA 353.2
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less
<u>Sample Volume:</u>	500 ml
<u>Sample Container:</u>	Plastic
<u>Sample Preservation:</u>	H ₂ SO ₄ , Cool to 4° C
<u>Sample Hold Time:</u>	48 hours --- SAMPLE MUST ARRIVE AT LAB AND BE EXTRACTED WITHIN 48 HOURS OF SAMPLING
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure
- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 100 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.



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Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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<u>Analyte:</u>	<i>Sulfate (SO₄)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	EPA 375
<u>Purging Method:</u>	Submersible or bladder pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less
<u>Sample Volume:</u>	500 ml
<u>Sample Container:</u>	Plastic
<u>Sample Preservation:</u>	Cool to 4° C
<u>Sample Hold Time:</u>	28 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure

- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 100 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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Sampling Procedures for Analytes
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(SOP-FS-GW-13)
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<u>Analyte:</u>	<i>Chloride (Cl)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	EPA 325.2
<u>Purging Method:</u>	Submersible or bladder pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less
<u>Sample Volume:</u>	500 ml
<u>Sample Container:</u>	Glass
<u>Sample Preservation:</u>	Cool to 4° C
<u>Sample Hold Time:</u>	28 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure

- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 100 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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Sampling Procedures for Analytes
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NOTE: LOW FLOW SAMPLING TECHNIQUE REQUIRED
HOLD TIME ALERT!!

<u>Analyte:</u>	<i>Total Organic Carbon (TOC)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	EPA 415.1
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 250 ml/min or less
<u>Sample Volume:</u>	100 ml
<u>Sample Container:</u>	Glass or poly
<u>Sample Preservation:</u>	H ₂ SO ₄ , Cool to 4° C
<u>Sample Hold Time:</u>	48 hours --- SAMPLE MUST ARRIVE AT LAB AND BE EXTRACTED WITHIN 48 HOURS OF SAMPLING
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure
- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 250 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.



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**Sampling Procedures for Analytes
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Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



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**Sampling Procedures for Analytes
Measured in the Analytical Laboratory**
(SOP-FS-GW-15)
Revision 1.0 – 01/09/01

NOTE: LOW FLOW SAMPLING TECHNIQUE REQUIRED

<u>Analyte:</u>	<i>Major Cations</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	6010B
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 250 ml/min or less
<u>Sample Volume:</u>	100 ml
<u>Sample Container:</u>	Plastic
<u>Sample Preservation:</u>	HNO ₃ , Cool to 4° C
<u>Sample Holding Time:</u>	28 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure
- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 250 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. Prepare apparatus to be cleaned and decontaminated according to procedures outlined in SOP-DECON-01.



Standard Operating Procedures
Boeing Realty Corporation Former C-6 Facility
Los Angeles, California

**Sampling Procedures for Analytes
Measured in the Analytical Laboratory**
(SOP-FS-GW-16)
Revision 1.0 – 01/09/01

<u>Analyte:</u>	<i>Aromatic and Chlorinated Hydrocarbons (8260)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	EPA-8260A
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less. No head space
<u>Sample Volume:</u>	3 x 40 ml
<u>Sample Container:</u>	40 ml glass VOA
<u>Sample Preservation:</u>	HCl, Cool to 4° C
<u>Sample Hold Time:</u>	14 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure

- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 40 ml/min or less with unfiltered, non-aerated sample water.
2. Positive meniscus (fill to top of VOA creating positive meniscus then fill cap prior to placing cap on VOA).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. DO probe should be cleaned and decontaminated according to procedures outlined in SOP DECON-02.



Standard Operating Procedures
Boeing Realty Corporation Former C-6 Facility
Los Angeles, California

**Sampling Procedures for Analytes
Measured in the Analytical Laboratory**
(SOP-FS-GW-17)
Revision 1.0 – 01/09/01

NOTE: LOW FLOW SAMPLING TECHNIQUE REQUIRED

<u>Analyte:</u>	<i>Soluble Manganese (Mn⁺²)</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	6010B
<u>Purging Method:</u>	Submersible pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 250 ml/min or less
<u>Sample Volume:</u>	100 ml
<u>Sample Container:</u>	Plastic/Glass
<u>Sample Preservation:</u>	HNO ₃ , Cool to 4° C
<u>Sample Hold Time:</u>	28 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure
- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 250 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1:	Monitoring Well Purge and Sample Form
See Form 4:	Daily Field Activity Report
See Form SA-1:	Sample Labels
See Form COC-1:	Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. DO probe should be cleaned and decontaminated according to procedures outlined in SOP DECON-02.



Standard Operating Procedures
Boeing Realty Corporation Former C-6 Facility
Los Angeles, California

Sampling Procedures for Analytes
Measured in the Analytical Laboratory
(SOP-FS-GW-18)
Revision 1.0 – 01/09/01

<u>Analyte:</u>	<i>Alkalinity</i>
<u>Matrix:</u>	Water
<u>Parameter Type:</u>	Fixed base laboratory
<u>Test Method:</u>	310.1
<u>Purging Method:</u>	Submersible or bladder pump with check valve in pump. Discharge hose should be nominal 0.5"-diameter clear Teflon tubing
<u>Collection Method:</u>	Clear hose – at pump flow rate as low as practical without visible bubbles in hose. Recommend 100 ml/min or less
<u>Sample Volume:</u>	500 ml
<u>Sample Container:</u>	Glass
<u>Sample Preservation:</u>	Cool to 4° C
<u>Sample Hold Time:</u>	14 days
<u>Sample Disposal:</u>	Laboratory disposal
<u>Handling:</u>	Samples should be collected and handled using protocols presented in the site-specific Health and Safety Plan (HASP)

Field Instrument Calibration Procedure
- NOT APPLICABLE -

Sample Collection Procedure

1. Fill container at rate of 100 ml/min or less with unfiltered, non-aerated sample water.
2. Leave head space (95% full).
3. Complete labeling and chain-of-custody (COC).
4. Place in cooler or refrigerator.

Data Recording Requirements

See Form 1: Monitoring Well Purge and Sample Form
See Form 4: Daily Field Activity Report
See Form SA-1: Sample Labels
See Form COC-1: Chain-of-custody

All applicable information must be completed by the sampling technician.

Equipment Decontamination

1. DO probe should be cleaned and decontaminated according to procedures outlined in SOP DECON-02.



ENGLAND GEOSYSTEM, INC.
STANDARD OPERATING PROCEDURES

STANDARD FIELD FORMS

- Monitoring Well Purge and Sample Form Form 1
- Water Levels Data Form Form 2
- Ground Water Field Parameters Form 3
- Daily Field Activity Report Form 4
- Sample Labels Form SA-1
- Chain-of-Custody Form COC-1

Boeing Realty Corporation

Monitoring Well Purge and Sample Form

Project Name: C-6 Facility **Project No.** _____

Well No. _____ **Tested by:** _____ **Date:** _____

Measuring Point Description: _____

Static Water Depth (ft): _____ **Sample Method:** _____

Water Level Measurement Instrument: _____ **Time Sampled:** _____

Purge Method: _____ **Depth to Water at Sampling:** _____

Time Start Purge: _____ **Time End Purge:** _____ **Total Volume Purge** _____

Field Preservation: _____

COMMENTS: _____

Casing Volume Calculation <i>(Fill in before purging)</i>	Total Depth (ft)	-	Depth to Water (ft)	=	Water Column (ft)	X	Multiplier for Well Size			=	One Well Casing Volume (gal)
							2-inch casing	4-inch casing	6-inch casing		
							0.17	0.66	1.47		
Time											
Depth to Water (Feet)											
Volume Purged (gallons)											
Purge Rate (gpm)											
Temperature (F°)											
pH											
Specific Conductivity (µs/cm) x 1000											
Color / Clearness											
Odor											
Number of Casing Volumes Removed											
Dewatered (Yes/No)											

Water Levels Data Form

BOE-C6-0048051

Boeing Realty Corporation, C-6 Facility – Ground Water Field Parameters

Type of Measuring Devices: _____

Measured By: _____

Well No.	Date	Time	pH	Conductivity (µs/cm)	Temp. (degrees Centigrade)	Dissolved Oxygen		ORP (mV)	Comments
						mg/l	%		
									Start of purge
									During purge
									During purge
									During purge
									Comments
									Start of purge
									During purge
									During purge
									During purge
									Comments
									Start of purge
									During purge
									During purge
									During purge
									Comments
									Start of purge
									During purge
									During purge
									During purge
									Comments
									Start of purge
									During purge
									During purge
									During purge
									Comments
									Start of purge
									During purge
									During purge
									During purge
									Comments

DAILY FIELD ACTIVITY REPORT

Client Name: _____ Project No.: _____

Project Name: _____ Date: _____

Contractor: _____ Arrival Time: _____

Weather: _____ Departure Time: _____

Time Breakdown: Drive _____ Work _____ Stand-by _____

Location And Description Of Activities: _____

Equipment Used On Project: _____

Activity Summary And General Remarks: _____

Technician Signature: _____ Date: _____

Contents of Sample Labels

Form SA-1

Boeing Realty Corporation C-6 Facility
Los Angeles, California

Project Name:
Project Number:
Sample Number:
Sample Location:
Sampler's Name:
Sampler's Company:
Date Collected:
Time Collected:
Type of Sample:
Requested Analysis:
Analysis Method:
Type of Preservative:

Standard Operating Procedures
Boeing Realty Corporation Former C-6 Facility
Los Angeles, California

References

Revision 1.0 – 01/09/01

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U.S. EPA. 1998. *"Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water,"* EPA/600/R-98/128. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.